Marine Protection Rules

Part 121B: Ship design and construction – ships other than oil tankers

MNZ Consolidation

26 August 2022

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Part objective

The technical standards contained in the International Convention for the Prevention of Pollution from Ships 1973/78 (MARPOL), are being incorporated into New Zealand law by means of marine protection rules. These rules enable New Zealand to be party to the Convention.

Specifically, Part 121B applies the requirements of regulations 14, 15, and 24 of Annex I of MARPOL to the design and construction of New Zealand ships, and ships of the New Zealand Defence Force, built after this Part comes into force that are not oil tankers but which carry oil cargoes in the quantities specified. Part 121B also applies to existing ships of these classes which undergo major conversions after Part 121B enters into force.

The issues dealt with in Part 121B include:

- Stopping the use of fuel oil tanks for carrying water ballast to prevent ballast water contaminated by oil being discharged into the sea.
- Stopping fuel oil being carried forward of the collision bulkhead – the area of the ship most prone to damage.
- Making ships which carry significant cargoes of oil – but which are not oil tankers – comply with certain standards applying to oil tankers.

The basis for Part 121B is found in sections 386 and 388 of the Maritime Transport Act 1994.

Marine protection rules are disallowable instruments under the Legislation Act 2012. Under that Act, the rules are required to be tabled in the House of Representatives. The House of Representatives may, by resolution, disallow any rules. The Regulations Review Committee is the select committee responsible for considering rules under that Act.

History of Part 121B

Part 121B first came into force on 20 August 1998 and now incorporates the following amendments:

Amendment	Effective date
Amendment 1	30 July 2009
Amendment 2	1 January 2015
Amendment 3	1 April 2015
Amendment 4	1 February 2018
Amendment 5	13 December 2019
Amendment 6	26 August 2022

Summary of amendments

Amendment 1

Marine Protection Amendment Rules 2009	121B.3, 121B.8–121B.10

Amendment 2

Marine Protection Rules Various Amendments 2014	121B.10(7)(c)(i), 121B.10(7)(c)(ii), 121B.10(7)(e)(i)

Amendment 3

Marine Protection Rules Various Amendments 2015	Part Objective, 121B.6(3), 121B.7(2)(c), 121B.10(7)

Amendment 4

Marine Protection Rules Various Amendments [Changes Related to Conventions] 2017	121B.2, 121B.7A (New Rule), 121B.8A (New Rule)

Amendment 5

Marine Protection Rules Various Amendments 2019	Part Objective

Amendment 6

Marine Protection Rules Part 199: Prevention of Air Pollution from Ships	121B.2

All signed rules can be found on our website:
https://www.maritimenz.govt.nz/Rules/

Contents

General

121B.1 Entry into force

Part 121B shall come into force on the 28th day after the date of its notification in the *Gazette.*

121B.2 Definitions

In Part 121B—

Act means the Maritime Transport Act 1994:

amidships means the middle of the length (L):

Antarctic area means the sea area south of latitude 60ºS:

Arctic waters means those waters which are located north of a line from the latitude 58º00´.0 N and longitude 042º00´.0 W to latitude 64º37´.0 N, longitude 035º27´.0 W and thence by a rhumb line to latitude 67º03´.9 N, longitude 026º33´.4 W and thence by a rhumb line to the latitude 70º49´.56 N and longitude 008º59´.61 W (Sørkapp, Jan Mayen) and by the southern shore of Jan Mayen to 73º31'.6 N and 019º01'.0 E by the Island of Bjørnøya, and thence by a great circle line to the latitude 68º38´.29 N and longitude 043º23´.08 E (Cap Kanin Nos) and hence by the northern shore of the Asian Continent eastward to the Bering Strait and thence from the Bering Strait westward to latitude 60º N as far as Il'pyrskiy and following the 60th North parallel eastward as far as and including Etolin Strait and thence by the northern shore of the North American continent as far south as latitude 60º N and thence eastward along parallel of latitude 60º N, to longitude 056º37´.1 W and thence to the latitude 58º00´.0 N, longitude 042º00´.0 W:

category A ship means a ship designed for operation in polar waters in at least medium first-year ice, which may include old ice inclusions:

category B ship means a ship not included in category A, designed for operation in polar waters in at least thin first-year ice, which may include old ice inclusions:

category C ship means a ship designed for operation in open water or in ice conditions less severe than those included in categories A and B:

centre tank means any tank inboard of a longitudinal bulkhead:

clean ballast means ballast carried in a tank which, since it was last used to carry oil, has been cleaned so that the outflow from that tank if it were discharged from a ship which is stationary into clean calm water on a clear day would not produce visible traces of oil on the surface of the water or on adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines. If the ballast is discharged through an oil discharge monitoring and control system approved by the Director under Part 122, evidence based on such a system to the effect that the oil content of the outflow did not exceed 15 parts per million shall be determinative that the ballast was clean, notwithstanding the presence of visible traces:

combination carrier means a ship designed to carry either oil or solid cargoes in bulk:

Director means the person who is for the time being the Director of Maritime Safety under section 439 of the Maritime Transport Act 1994:

first-year ice means sea ice of not more than one winter growth developing from young ice with thickness from 30 cm to 200 cm:

major conversion means a conversion of a ship built before the entry into force of Part 121B—

(a) which substantially alters the dimensions or carrying capacity of the ship; or

(b) which changes the type of ship; or

(c) the intent of which in the opinion of the Director is substantially to prolong its life; or

(d) which otherwise so alters the ship that, if it were built after the coming into force of Part 121B, it would become subject to the relevant provisions of Part 121B:

medium first-year ice means first-year ice of 70 cm to 120 cm thickness:

New Zealand Defence Force has the same meaning as the term “Defence Force” in section 2(1) of the Defence Act 1990:

New Zealand ship means a ship that is registered under the Ship Registration Act 1992; and includes a ship that is not registered under that Act but is required or entitled to be registered under that Act:

oil for the purposes of the marine protection rules and section 222 of the Maritime Transport Act 1994 means petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products (other than petrochemicals that are subject to the provisions of Part 140). Without limiting the generality of the foregoing, “oil” includes the substances declared to be oil in the appendix to Part 120, and any oily mixture. “Oil” as defined here is a “harmful substance” for the purposes of section 225 of the Maritime Transport Act 1994:

oil fuel means any oil used as fuel in connection with the propulsion and auxiliary machinery of the ship in which such oil is carried:

oil tanker means a ship constructed or adapted primarily to carry oil in bulk in its cargo spaces; and includes combination carriers and any "chemical tanker" as defined in rule 141.2 when it is carrying a cargo or part cargo of oil in bulk:

oily mixture means a mixture with any oil content:

old ice means sea ice which has survived at least one summer's melt:

open water means a large area of freely navigable water in which sea ice is present in concentrations less than 1/10 and no ice of land origin is present:

owner in relation to any ship includes—

(a) any person who is the legal or equitable owner, or both, of the ship; and

(b) any person in possession of the ship; and

(c) any charterer, manager, or operator of the ship, or any other person (other than a pilot) responsible for the navigation or management of the ship:

Part means a group of rules made under the Maritime Transport Act 1994:

polar waters means any of the following:

(a) Arctic waters:

(b) the Antarctic area:

reception facility has the meaning set out in section 222(1A) of the Act:

rules includes maritime rules and marine protection rules:

slop tank means a tank specifically designated for the collection of tank drainings, tank washings and other oily mixtures:

tank means an enclosed space which is formed by the permanent structure of a ship and which is designed for the carriage of liquid in bulk:

thin first-year ice means first-year ice 30 cm to 70 cm thick:

wing tank means any tank adjacent to the side shell plating.

121B.3 Application

Rules 121B.4 to 121B.7 inclusive apply to—

(a) every New Zealand ship that is not an oil tanker; and

(b) every warship and every other ship of the New Zealand Defence Force, that is not an oil tanker;

the keel of which is laid or which is at a similar stage of construction, or which has undergone a major conversion, on or after the date of coming into force of Part 121B.

Design and construction requirements

121B.4 Segregation of oil fuel and water ballast

(1) Except as provided for in rule 121B.4(2), the owner of any ship to which this rule applies which is—

(a) a ship of 4000 tons gross tonnage or more; or

(b) a ship of 150 tons gross tonnage or more which is fitted with cargo spaces designed and constructed to carry oil in bulk of an aggregate capacity of 200 cubic metres or more;

must ensure that the ship's design and construction does not provide for the carriage of ballast water in any oil fuel tank.

(2) Where—

(a) abnormal conditions; or

(b) the need to carry large quantities of oil fuel;

make it necessary for the ship's design and construction to provide for the carriage of ballast water, which is not clean ballast, in any oil fuel tanks, the owner of the ship must ensure that means are provided so that such ballast water can be discharged:

(i) to reception facilities; or

(ii) into the sea;

in compliance with the requirements of Part 120, using equipment which complies with the requirements of Part 122.

(3) The owner of any ship to which this rule applies, other than a ship subject to rule 121B.4(1), must ensure that the design and construction of the ship does not provide for the carriage of ballast water in any oil fuel tank, unless an exemption from rule 121B.4(3) is granted under section 395 of the Act.

121B.5 Carriage of oil in the forepeak

(1) The owner of any ship of 400 tons gross tonnage or more to which this rule applies, must ensure that the design and construction of the ship does not provide for the carriage of oil in—

(a) any forepeak tank; or

(b) any tank forward of the collision bulkhead.

(2) The owner of any ship to which this rule applies, other than one required to comply with rule 121B.5(1), must comply with rule 121B.5(1) unless an exemption is granted under section 395 of the Act.

121B.6 Slop tanks

(1) Subject to rule 121B.6(2), the owner of any ship to which this rule applies which is fitted with cargo spaces designed and constructed to carry oil in bulk of an aggregate

capacity of 200 cubic metres or more must ensure that the ship is provided with adequate means of—

(a) cleaning the cargo tanks; and

(b) transferring the dirty ballast residue and tank washings from the cargo tanks into a slop tank which meets the requirements of rule 121B.6(3).

(2) No slop tank is required to be fitted to a ship where—

(a) the cargo spaces for the carriage of oil in bulk have an aggregate capacity of less than 1000 cubic metres; and

(b) the control of discharge of oil under Part 120 is to be effected by the retention of oil on board with subsequent discharge of all contaminated washings to reception facilities.

(3) The owner of any ship to which this rule applies, which is not a ship referred to in rule 121B.6(2), must ensure that the slop tank or combination of slop tanks have a capacity necessary to retain the slop generated by—

(a) tank washings; and

(b) oil residues; and

(c) dirty ballast residues.

The total capacity of the slop tank or tanks must not be less than 3 percent of the oil carrying capacity of the ship. The Director may accept a capacity of 2 percent of the carrying capacity of the ship where the tank washing arrangements are to be such that once the slop tank or tanks are charged with washing water, this water is sufficient for tank washing and, where applicable, for providing the driving fluid for eductors, without the introduction of additional water into the system.

121B.7 Limitation of size of oil cargo tanks

(1) The owner of any ship to which this rule applies which is to be fitted with cargo spaces designed and constructed to carry oil in bulk of an aggregate capacity of 200 cubic metres or more, must ensure that the length of each cargo tank does not exceed 10 metres or one of the following values, whichever is greater—

(a) where no longitudinal bulkhead is provided inside the cargo tanks:

$(0.5\ b_{i/B} + 0.1)L$

but not to exceed 0.2L; or

(b) where a centreline longitudinal bulkhead is provided inside the cargo tanks:

$(0.25\ b_{i/B} + 0.15)L$; or

(c) where two or more longitudinal bulkheads are provided:

(i) for wing cargo tanks: 0.2L

(ii) for centre cargo tanks:

(aa) if $b_{i/B}$ is equal to or greater than one fifth: 0.2L

(bb) if $b_{i/B}$ is less than one fifth:

- where no centreline longitudinal bulkhead is provided:

  $(0.5\ b_{i/B} + 0.1)L$

- where a centreline longitudinal bulkhead is provided:

  $(0.25\ b_{i/B} + 0.15)L$

(2) The following definitions apply in rule 121B.7(1)—

(a) b_i is the minimum distance from the ship's side to the outer longitudinal bulkhead of the tank in question measured inboard at right angles to the centreline at the level corresponding to the assigned summer freeboard; and

(b) **"Breadth" (B)** means the maximum breadth of the ship, measured amidships to the moulded line of the frame in a ship with a metal shell and to the outer surface of the hull in a ship with a shell of any other material. The breadth (B) shall be measured in metres; and

(c) **"Length" (L)** means 96 percent of the total length on a waterline at 85 percent of the least moulded depth measured from the top of the keel, or the length from the foreside of the stem to the axis of the rudder stock on that waterline, if that be greater. In ships designed with a rake of keel the waterline on which this length is measured shall be parallel to the designed waterline. The length (L) shall be measured in metres.

121B.7A Oil residue (sludge) tanks and oily bilge water holding tanks in polar waters

(1) This rule 121B.7A applies to a ship—

(a) that is a category A or category B ship that is not an oil tanker; and

(b) with an oil residue (sludge) tank or oily bilge water holding tank with a maximum individual capacity of more than 30 m^3; and

(c) that is in polar waters; and

(d) the keel of which was laid or which was at a similar stage of construction on or after 1 February 2018.

(2) The owner of a ship to which this rule applies must ensure that each oil residue (sludge) tank and oily bilge water holding tank that has a maximum individual capacity of more than 30 m^3 is separated from the outer shell by a distance of not less than 0.76 m.

Oil fuel tank protection

121B.8 Application of oil fuel tank protection requirements

(1) Rule 121B.10 applies to every ship that is not an oil tanker with an aggregate oil fuel capacity of 600 m3 and above—

(a) for which the building contract is placed on or after 1 August 2007; or

(b) in the absence of a building contract, the keels of which are laid or which are at a similar stage of construction on or after 1 February of which is on or after 1 August 2010; or

(c) the delivery of which is on or after 1 August 2010; or

(d) which has undergone a major conversion:

(i) for which the contract is placed on or after 1 August 2007; or

(ii) in the absence of contract, the construction work of which is begun on or after 1 February 2008; or

(iii) which is completed on or after 1 August 2010.

(2) These rules apply to the design, location and construction of all oil fuel tanks except small oil fuel tanks provided that the aggregate capacity of such excluded tanks is not greater than 600 m^3.

121B.8A Oil fuel tank protection in polar waters

(1) This rule 121B.8A applies to a ship—

(a) that is a category A or category B ship that is not an oil tanker; and

(b) with an aggregate oil fuel capacity of less than 600 m^3, excluding oil fuel tanks with a maximum individual capacity of 30 m^3 or less; and

(c) that is in polar waters; and

(d) the keel of which was laid or which was at a similar stage of construction on or after 1 February 2018.

(2) The owner of a ship to which this rule applies must ensure that each oil fuel tank is separated from the outer shell by a distance of not less than 0.76 m.

121B. 9 Definitions for oil fuel tank protection rules

For the purposes of rules 121B.8 to 121B.10, the following definitions apply—

Breadth (B) means the maximum breadth of the ship, in metres, measured amidships to the moulded line of the frame in a ship with a metal shell and to the outer surface of the hull in a ship with a shell of any other material:

Breadth (B_S) is the greatest moulded breadth of the ship, in metres, at or below the deepest load line draught (d_S):

Breadth (B_B) is the greatest moulded breadth of the ship, in metres, at or below the waterline (d_B):

C is the ship's total volume of oil fuel, including that of the small oil fuel tanks, in m^3, at 98% tank filling:

Depth (D_S) is the moulded depth, in metres, measured at mid-length to the upper deck at side. For the purpose of the application, "upper deck" means the highest deck to which the watertight transverse bulkheads except aft peak bulkheads extend:

Length (L) means 96% of the total length on a waterline at 85% of the least moulded depth measured from the top of the keel, or the length from the foreside of the stem to the axis of the rudder stock on that waterline, if that be greater.

In ships designed with a rake of keel the waterline on which this length is measured shall be parallel to the designed waterline. The length (L) shall be measured in metres:

Load line draught (d_S) is the vertical distance, in metres, from the moulded baseline at mid-length to the waterline corresponding to the summer freeboard draught to be assigned to the ship:

Light ship draught is the moulded draught amidships corresponding to the Lightweight:

Oil fuel means any oil used as fuel oil in connection with the propulsion and auxiliary machinery of the ship in which such oil is carried:

Oil fuel capacity means the volume of a tank in m^3, at 98% filling:

Oil fuel tank means a tank in which oil fuel is carried, but excludes those tanks which would not contain oil fuel in normal operation, such as overflow tanks:

Partial load line draught (d_P) is the light ship draught plus 60% of the difference between the light ship draught and the load line draught d_S. The partial load line draught (d_p) shall be measured in metres:

Waterline (d_B) is the vertical distance, in metres, from the moulded baseline at mid-length to the waterline corresponding to 30% of the depth D_S:

Small oil fuel tank is an oil fuel tank with a maximum individual capacity not greater than 30 m^3.

121B.10 Oil fuel tank protection

(1) Oil fuel tanks shall be located above the moulded line of the bottom shell plating nowhere less than the distance (h) as specified below—

h = B/20 m or,

h = 2.0 m, whichever is the lesser.

The minimum value of h = 0.76 m

(2) In the turn of the bilge area and at locations without a clearly defined turn of the bilge, the oil fuel tank boundary line shall run parallel to the line of the midship flat bottom as shown in Figure 1.

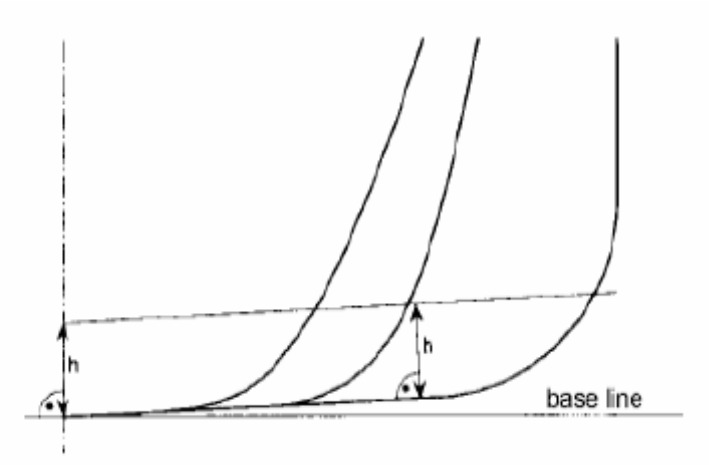

Figure 1 – Oil fuel tank boundary lines for ships with oil fuel capacity of 600 m^3 or more but less than 5,000 m^3

(3) For ships having an aggregate oil fuel capacity of 600 m^3 or more but less than 5,000 m^3, oil fuel tanks shall be located inboard of the moulded line of the side shell plating, nowhere less than the distance w which, as shown in Figure 2, is measured at any cross-section at right angles to the side shell, as specified below:

w = 0.4 + 2.4 C/20,000 m

The minimum value of w = 1.0 m, however for individual tanks with an oil fuel capacity of less than 500 m^3 the minimum value is 0.76 m.

(4) For ships having an aggregate oil fuel capacity of 5,000 m^3 or more, oil fuel tanks shall be located inboard of the moulded line of the side shell plating, nowhere less than the distance w which, as shown in Figure 2, is measured at any cross-section at right angles to the side shell, as specified below:

w = 0.5 + C/20,000 m or

w = 2.0 m, whichever is the lesser.

The minimum value of w = 1.0 m

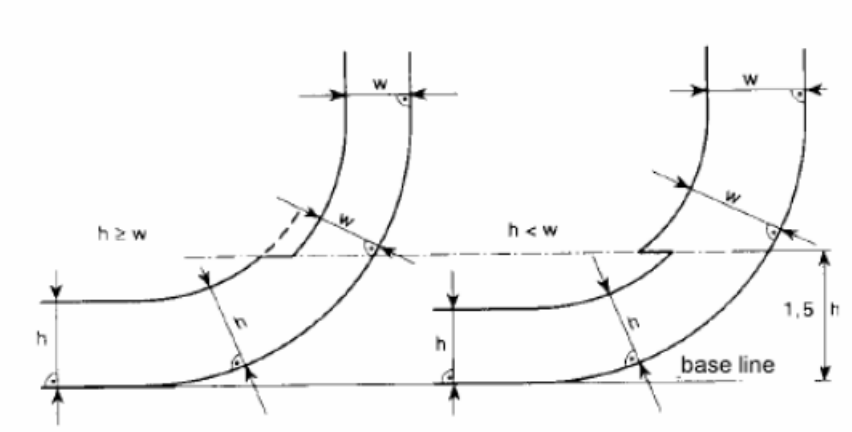

Figure 2 – Oil fuel tank boundary lines for the purposes of subrules (3) and (4)

(5) Lines of oil fuel piping located at a distance from the ship's bottom of less than h, as defined in subrule (1), or from the ship's side less than w, as defined in subrules (3) and (4) shall be fitted with valves or similar closing devices within or immediately adjacent to the oil fuel tank. These valves shall be capable of being brought into operation from a readily accessible enclosed space the location of which is accessible from the navigation bridge or propulsion machinery control position without traversing exposed freeboard or superstructure decks. The valves shall close in case of remote control system failure (fail in a closed position) and shall be kept closed at sea at any time when the tank contains oil fuel except that they may be opened during oil fuel transfer operations.

(6) Suction wells in oil fuel tanks may protrude into the double bottom below the boundary line defined by the distance h provided that such wells are as small as practicable and the distance between the well bottom and the bottom shell plating is not less than 0.5 h.

(7) Alternatively to subrules (1) and either (3) or (4), ships shall comply with the accidental oil fuel outflow performance standard specified below—

(a) The level of protection against oil fuel pollution in the event of collision or grounding shall be assessed on the basis of the mean oil outflow parameter as follows—

$O_M < 0.0157\text{-}1.14E\text{-}6 \ .C$ $\quad 600\ m^3 \leq C < 5{,}000\ m^3$

$O_M < 0.010$ $\quad C \geq 5{,}000\ m^3$

Where O_M = mean oil outflow parameter;
C = total oil fuel volume.

(b) The following general assumption shall apply when calculating the mean oil outflow parameter:

(i) the ship shall be assumed loaded to the partial load line draught d_P without trim or heel;

(ii) all oil fuel tanks shall be assumed loaded to 98% of their volumetric capacity;

(iii) the nominal density of the oil fuel (ρ_n) shall generally be taken as 1,000 kg/m^3. If the density of the oil fuel is specifically restricted to a lesser value, the lesser value may be applied; and

(iv) for the purpose of these outflow calculations, the permeability of each oil fuel tank shall be taken as 0.99, unless proven otherwise.

(c) The following assumptions shall be used when combining the oil outflow parameters:

(i) The mean oil outflow shall be calculated independently for side damage and for bottom damage and then combined into a non-dimensional oil outflow parameter O_M, as follows:

$O_M = (0.4\ O_{MS} + 0.6\ O_{MB}) / C$

Where—

O_{MS} = mean outflow for side damage, in m^3

O_{MB} = mean outflow for bottom damage, in m^3

C = total oil fuel volume.

(ii) For bottom damage, independent calculations for mean outflow shall be done for 0 m and 2.5 m tide conditions, and then combined as follows:

$O_{MB} = 0.7\ O_{MB}(0) + 0.3\ O_{MB}(2.5)$

Where—

$O_{MB}(0)$ = mean outflow for 0 m tide condition, and

$O_{MB}(2.5)$= mean outflow for minus 2.5 m tide condition, in m^3.

(d) The mean outflow for side damage OMS shall be calculated as follows:

$$O_{MS} = \sum_{i}^{n} P_{S(i)}\, O_{S(i)}\ [m^3]$$

Where—

i = represents each oil fuel tank under consideration;

n = total number of oil fuel tanks;

$P_{S(i)}$ = the probability of penetrating oil fuel tank i from side damage, calculated in accordance with subrule (7)(f);

$O_{S(i)}$ = the outflow, in m^3, from side damage to oil fuel tank i, which is assumed equal to the total volume in oil fuel tank i at 98% filling.

(e) The mean outflow for bottom damage shall be calculated for each tidal condition as follows—

(i) $$O_{MB(0)} = \sum_{i}^{n} P_{B(i)}\, O_{B(i)}\, C_{DB(i)}\ [m^3]$$

Where—

i = represents each oil fuel tank under consideration;

n = total number of oil fuel tanks;

$P_{B(i)}$ = the probability of penetrating oil fuel tank i from bottom damage, calculated in accordance with subrule (7)(g);

$O_{B(i)}$ = the outflow from oil fuel tank i, in m^3, calculated in accordance with subrule (7)(e)(iii) of this regulation; and

$C_{DB(i)}$ = factor to account for oil capture as defined in subrule (7)(e)(iii)(dd).

(ii) $$O_{MB(2.5)} = \sum_{i}^{n} P_{B(i)}\, O_{B(i)}\, C_{DB(i)}\ [m^3]$$

Where—

i, n, $P_{B(i)}$ and $C_{DB(i)}$ = as defined in this subrule

$O_{B(i)}$ = the outflow from oil fuel tank i, in m^3, after tidal change.

(iii) The oil outflow $O_{B(i)}$ for each oil fuel tank shall be calculated based on pressure balance principles, in accordance with the following assumptions—

(aa) The ship shall be assumed stranded with zero trim and heel, with the stranded draught prior to tidal change equal to the partial load line draught d_P.

(bb) The oil fuel level after damage shall be calculated as follows—

hF = $\{(d_P + tC - Zl)(\rho S)\}/\rho n$ where: hF = the height of the oil fuel surface above Zl, in m;

tC = the tidal change, in m. Reductions in tide shall be expressed as negative values;

Zl = the height of the lowest point in the oil fuel tank above the baseline, in m;

ps = density of seawater, to be taken as 1,025 kg/ m^3; and,

ρn = nominal density of the oil fuel, as defined in subrule (7)(b)(iii).

(cc) The oil outflow $O_{B(i)}$ for any tank bounding the bottom shell plating shall be taken to be not less than the sum of the following formula, but no more than the tank capacity—

$O_{B(i)} = Hw\ A$

where—

H_W = 1.0 m, when $Y_B = 0$;

H_W = $B_B/50$ but not greater than 0.4 m, when Y_B is greater than $B_B/5$ or 11.5 m, whichever is less; and, "H_W" is to be measured upwards from the midship flat bottom line. In the turn of the bilge area and at locations without a clearly defined turn of the bilge, H_W is to be measured from a line parallel to the midship flat bottom, as shown for distance "h" in Figure 1.

For Y_B values outboard $B_B/5$ or 11.5 m, whichever is less, H_W is to be calculated by linear interpolation.

Y_B = the minimum value of Y_B over the length of the oil fuel tank, where at any given location, Y_B is the transverse distance between the side shell at waterline d_B and the tank at or below waterline d_B.

A = the maximum horizontal projected area of the oil fuel tank up to the level of Hw from the bottom of the tank.

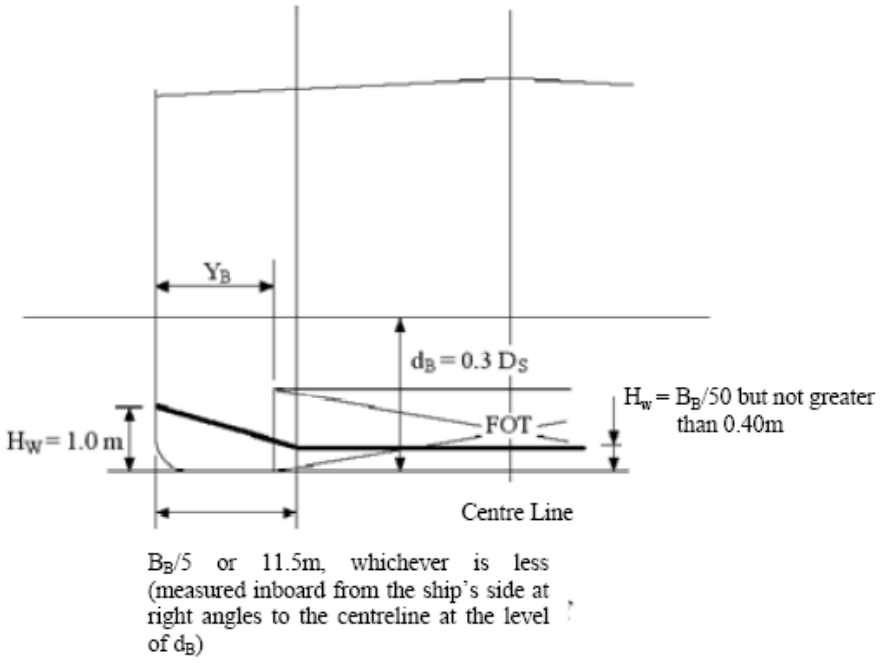

Figure 3 – Dimensions for calculation of the minimum oil outflow for the purpose of subrule (7)(e)(iii)(cc)

(dd) In the case of bottom damage, a portion from the outflow from an oil fuel tank may be captured by non-oil compartments. This effect is approximated by application of the factor $C_{DB(i)}$ for each tank, which shall be taken as follows—

$C_{DB(i)}$ = 0.6 for oil fuel tanks bounded from below by non-oil compartments;

$C_{DB(i)}$ = 1 otherwise.

(f) The probability P_S of breaching a compartment from side damage shall be calculated as follows—

(i) $P_S = P_{SL} \cdot P_{SV} \cdot P_{ST}$

where—

P_{SL} = $(1 – P_{Sf} – P_{Sa})$ = probability the damage will extend into the longitudinal zone bounded by X_a and X_f;

P_{SV} = $(1 – P_{Su} – P_{Sl})$ = probability the damage will extend into the vertical zone bounded by Z_l and Z_u;

P_{ST} = $(1 – P_{Sy})$ = probability the damage will extend transversely beyond the boundary defined by y;

(ii) P_{Sa}, P_{Sf}, P_{Su} and P_{Sl} shall be determined by linear interpolation from the table of probabilities for side damage provided in subrule (7)(f)(iii), and P_{Sy} shall be calculated from the formulas provided in that subrule, where—

P_{Sa} = the probability the damage will lie entirely aft of location X_a/L;

P_{Sf} = the probability the damage will lie entirely forward of location X_f/L;

P_{Sl} = probability the damage will lie entirely below the tank;

P_{Su} = probability the damage will lie entirely above the tank; and

P_{Sy} = probability the damage will lie entirely outboard the tank.

Compartment boundaries X_a, X_f, Z_l, Z_u and y shall be developed as follows—

X_a = the longitudinal distance from aft terminal of L to the aft most point on the compartment being considered, in m;

X_f = the longitudinal distance from aft terminal of L to the foremost point on the compartment being considered, in m;

Z_l = the vertical distance from the moulded baseline to the lowest point on the compartment being considered, in m. Where Z_l is greater than D_S, Z_l shall be taken as D_S;

Z_u = the vertical distance from the moulded baseline to the highest point on the compartment being considered, in m. Where Z_u is greater than D_S, Z_u shall be taken as D_S; and,

y = the minimum horizontal distance measured at right angles to the centreline between the compartment under consideration and the side shell, in m.[1]

In way of the turn of the bilge, y need not to be considered below a distance h above baseline, where h is lesser of B/10, 3 m or the top of the tank.

(iii) Table of probabilities for side damage

X_a /L	P_{Sa}
0.00	0.000
0.05	0.023
0.10	0.068
0.15	0.117
0.20	0.167
0.25	0.217
0.30	0.267
0.35	0.317
0.40	0.367
0.45	0.417
0.50	0.467
0.55	0.517
0.60	0.567
0.65	0.617
0.70	0.667
0.75	0.717
0.80	0.767
0.85	0.817
0.90	0.867
0.95	0.917
1.00	0.967

X_f /L	P_{Sf}
0.00	0.967
0.05	0.917
0.10	0.867
0.15	0.817
0.20	0.767
0.25	0.717
0.30	0.667
0.35	0.617
0.40	0.567
0.45	0.517
0.50	0.467
0.55	0.417
0.60	0.367
0.65	0.317
0.70	0.267
0.75	0.217
0.80	0.167
0.85	0.117
0.90	0.068
0.95	0.023
1.00	0.000

Z_l/D_S	P_{Sl}
0.00	0.000
0.05	0.000
0.10	0.001
0.15	0.003
0.20	0.007
0.25	0.013
0.30	0.021
0.35	0.034
0.40	0.055
0.45	0.085
0.50	0.123
0.55	0.172
0.60	0.226
0.65	0.285
0.70	0.347
0.75	0.413
0.80	0.482
0.85	0.553
0.90	0.626
0.95	0.700
1.00	0.775

Z_u/D_s	P_{Su}
0.00	0.968
0.05	0.952
0.10	0.931
0.15	0.905
0.20	0.873
0.25	0.836
0.30	0.789
0.35	0.733
0.40	0.670
0.45	0.599
0.50	0.525
0.55	0.452
0.60	0.383
0.65	0.317
0.70	0.255
0.75	0.197
0.80	0.143
0.85	0.092
0.90	0.046
0.95	0.013
1.00	0.000

[1] For symmetrical tank arrangements, damages are considered for one side of the ship only, in which case all "y" dimensions are to be measured from that side. For asymmetrical arrangements reference is made to the explanatory notes on matters related to the accidental oil outflow performance, adopted by the Organization by resolution MEPC.122(52).

P_{Sy} shall be calculated as follows—

$P_{Sy} = (24.96 – 199.6\ y/B_S)\ (y/B_S)$ for $y/B_S \leq 0.05$

$P_{Sy} = 0.749 + \{5 – 44.4\ (y/B_S – 0.05)\}\ \{(y/B_S) – 0.05\}$ for $0.05 < y/B_S < 0.1$

$P_{Sy} = 0.888 + 0.56\ (y/B_S - 0.1)$ for $y/B_S \geq 0.1$

P_{Sy} is not to be taken greater than 1.

(g) The probability P_B of breaching a compartment from bottom damage shall be calculated as follows—

(i) $P_B = P_{BL} . P_{BT} . P_{BV}$ where—

P_{BL} = $(1 – P_{Bf} – P_{Ba})$ = probability the damage will extend into the longitudinal zone bounded by X_a and X_f;

P_{BT} = $(1 – P_{Bp} – P_{BS})$ = probability the damage will extend into transverse zone bounded by X_p and X_s; and

P_{BV} = $(1 – P_{Bz})$ = probability the damage will extend vertically above the boundary defined by z;

(ii) P_{Ba}, P_{Bf}, P_{Bp} and P_{BS} shall be determined by linear interpolation from the table of probabilities for bottom damage provided in subrule (7)(g)(iii), and P_{Bz} shall be calculated from the formulas provided in that sub-rule, where—

P_{Ba} = the probability the damage will lie entirely aft of location X_a/L;

P_{Bf} = the probability the damage will lie entirely forward of location X_f/L;

P_{Bp} = probability the damage will lie entirely to port of the tank;

P_{Bs} = probability the damage will lie entirely to starboard the tank; and

P_{Bz} = probability the damage will lie entirely below the tank.

Compartment boundaries X_a, X_f, X_p, X_s and z shall be developed as follows—

X_a and X_f as defined in subrule(7)(f)(ii);

X_p = the transverse distance from the port-most point on the compartment located at or below the waterline d_B, to a vertical plane located $B_B/2$ to starboard of the ship's centreline;

X_s = the transverse distance from the starboard-most point on the compartment located at or below the waterline d_B, to a vertical plane located $B_B/2$ to starboard of the ship's centreline; and

z = the minimum value of z over the length of the compartment, where, at any given longitudinal location, z is the vertical distance from the lower point of the bottom shell at that longitudinal location to the lower point of the compartment at that longitudinal location.

(iii) Table of probabilities for bottom damage

X_a /L	P_{Ba}
0.00	0.000
0.05	0.002
0.10	0.008
0.15	0.017
0.20	0.029
0.25	0.042
0.30	0.058
0.35	0.076
0.40	0.096
0.45	0.119
0.50	0.143
0.55	0.171
0.60	0.203
0.65	0.242
0.70	0.289
0.75	0.344
0.80	0.409
0.85	0.482
0.90	0.565
0.95	0.658
1.00	0.761

X_f /L	P_{Bf}
0.00	0.969
0.05	0.953
0.10	0.936
0.15	0.916
0.20	0.894
0.25	0.870
0.30	0.842
0.35	0.810
0.40	0.775
0.45	0.734
0.50	0.687
0.55	0.630
0.60	0.563
0.65	0.489
0.70	0.413
0.75	0.333
0.80	0.252
0.85	0.170
0.90	0.089
0.95	0.026
1.00	0.000

Y_p B_B	P_{Bp}
0.00	0.844
0.05	0.794
0.10	0.744
0.15	0.694
0.20	0.644
0.25	0.594
0.30	0.544
0.35	0.494
0.40	0.444
0.45	0.394
0.50	0.344
0.55	0.297
0.60	0.253
0.65	0.211
0.70	0.171
0.75	0.133
0.80	0.097
0.85	0.063
0.90	0.032
0.95	0.009
1.00	0.000

Y_S/B_B	P_{Bs}
0.00	0.000
0.05	0.009
0.10	0.032
0.15	0.063
0.20	0.097
0.25	0.133
0.30	0.171
0.35	0.211
0.40	0.253
0.45	0.297
0.50	0.344
0.55	0.394
0.60	0.444
0.65	0.494
0.70	0.544
0.75	0.594
0.80	0.644
0.85	0.694
0.90	0.744
0.95	0.794
1.00	0.844

P_{Bz} shall be calculated as follows—

$P_{Bz} = (14.5 – 67\ z/D_S)\ (z/D_S)$ for $z/D_S \leq 0.1$

$P_{Bz} = 0.78 + 1.1 \{(z/D_S - 0.1)\}$ for $z/D_S > 0.1$

P_{Bz} is not to be taken greater than 1.

(h) For the purpose of maintenance and inspection, any oil fuel tanks that do not border the outer shell plating shall be located no closer to the bottom shell plating than 0.76 m and no closer to the side shell plating than the applicable value of *w* in subrule (3) or (4).

(8) Individual oil fuel tanks must not have a capacity of over 2,500m^3.

(9) Before approving the design and construction of ships to be built in accordance with this rule, the Director must be satisfied that the design—

(a) has due regard to the need for maintenance and inspection of wing and double bottom tanks or spaces; and

(b) is such to ensure that the ship is seaworthy in all respects.